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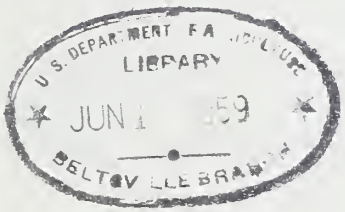
PROGRESS IN APPLICATION OF SOIL-CONSERVING PRACTICES



SOUTHWESTERN WISCONSIN

Agricultural Research Service

in cooperation with

Wisconsin Agricultural Experiment Station

UNITED STATES DEPARTMENT OF AGRICULTURE

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CONTENTS

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PROGRESS IN APPLICATION OF SOIL-CONSERVING PRACTICES, SOUTHWESTERN WISCONSIN

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SUMMARY AND CONCLUSIONS

Soil losses have been severe on many farms in Wisconsin since the beginning of cultivation nearly a century ago. This is true of most soils in Sauk, Richland, Juneau, Vernon, and Monroe Counties in southwestern Wisconsin, but it is especially true of the Gale-Hixton soils.

Concerted action to obtain adequate soil conservation was begun in 1940 through the establishment of a soil conservation district in each of the 5 counties. After 15 years, 45 percent of the farmers were cooperating in the soil conservation district program.

A study was made in 1955 of 127 farms in the 5 counties to learn what progress farmers had made in carrying out soil conservation programs for their farms and the effects of the programs on farm production and income.

The farms, which were grouped into high-, medium-, and low-conservation farms, had been operated under soil-conserving plans for averages of 10, 8, and 5 years for the 3 groups, respectively. Almost two-thirds of the farmers said they had no material difficulties in establishing conservation practices. Most of the difficulties on the high-conservation farms were in connection with rotations, whereas contour strips were more troublesome for the medium- and low-conservation groups.

Practices such as use of contour strips, terraces, and diversions were given the highest ratings as conservation measures by the farmers. All farmers who had built terraces and diversions reported excellent success in

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erosion control. Vegetative cover and the use of lime and commercial fertilizers were more favored by the low-conservation farmers, even though they were not following fully the recommended rotations. Contour strips were laid out on all except one of the farms.

Seventeen percent of the farmers said that lack of time was an important reason for the delay in adopting soil conservation practices. Thirty-five percent said that lack of capital was one of the principal deterrents, but none said that lack of credit had hampered adoption of conservation practices.

Most of the farmers thought that on-the-farm planning was necessary to insure adequate conservation planning. Many said that much help in planning conservation programs could be obtained at meetings, provided the programs were followed by technical on-the-farm assistance.

Fifty-eight percent of the cropland was in perennial hay crops on the group of farms where erosion hazards were greatest, as compared with 49 percent on farms with less severe erosion problems. Cropping systems on all farms averaged approximately 18 percent fewer acres in meadow than are usually recommended.

Nearly three-fourths of the farmers substituted grass silage for corn silage as a means of utilizing the increased hay supply. Forty-three percent of those who started using grass silage continued the practice each year. About the same proportion discontinued it after a trial of a year or two. Forty percent reported a decrease in milk production when grass silage replaced corn silage in the ration, as compared with 43 percent who reported no change and 17 percent who reported an increase in production.

Crop yields on the high-conservation farms were 7 percent above the average of the 127 farms, as compared with yields of 10 percent below average for the low-conservation group.

Even though pasture renovation was rated the second most important practice as a part of a soil-conserving program, it was at the bottom of the list of applied conservation practices. Lack of time, the high cost, and lack of equipment were given as the main reasons for the delay in the renovation program.

One-fifth of the farmers reported that they had improved grass waterways. Some had eliminated a part of their grass waterways because terraces, diversions, contour strips, and increased acreage of hay made them unnecessary.

Dairy cattle comprised 87 percent of all productive animal units, and hogs accounted for about 10 percent. Only 14 percent of the farmers reported an excess of forage in relation to grain, but more of them probably would have had problems of this kind had the acreage of hay equaled the planned figure. Higher yields of corn and grain offset the decrease in acreage of hay, and together with partial substitution of grass silage for corn silage, enabled many farmers to maintain the same balance of dairy cattle and hogs that they had had before they started conservation farming.

Attitudes of farmers to specific soil-conserving practices change as they gain experience with the program. Farmers also adjust their conservation plans to conform to other changes in the management and operation of their farms.

Yields of crops were 8 percent higher for each additional 3 years of conservation farming. Livestock averaged 54, 49, and 43 animal units per 100 acres, respectively, for the high-, medium-, and low-conservation farming groups. On a crop-acre basis, farm income and farm expenses as well as net farm income were highest on high-conservation farms and lowest for low-conservation farms. Net income averaged $1.00 per acre of crops higher for each year of conservation farming.

Farmers who adopted soil-conserving practices had higher incomes than before adoption of the practices. Further, farmers frequently deviate from the planned conservation program. These changes are inevitable and desirable, when properly made, because of the dynamic nature of farming. If farmers are to come close to the twin goals of high income and adequate conservation of soil, two things are necessary: (1) Continued search for better alternatives in conservation plans, and (2) continued technical assistance to farmers in keeping their conservation programs up to date.

Soil conservation plans which provide for adequate erosion control should be prepared for each farm. The farmer will then have a guide for improving his conservation program as opportunity arises.

The labor force and the barn space on many farms are taxed to the limit by the requirements of existing dairy herds. Returns per hour of labor spent on dairy herds during the last few years have been lower than the returns to labor used in hog production. These factors tend to influence farmers to raise more hogs rather than to increase production of milk when the greater quantity of feed produced increases the livestock-carrying capacity of the farm. Because of them, also, farmers may decide not to increase their acreages of meadow to the extent set forth in the plans for their farms.

A major reason for the dominant position of dairying in Wisconsin is the large supply of low-cost pasture provided by land that has little or no cropping alternative. With an increase in the acreage of meadow (and in dairy cattle) in conservation farming, more of the pasture must come either from cropland or from permanent pasture, the renovation of which means considerable labor and money. These costs may cause a farmer to use alternative conservation measures and to increase his hog rather than his dairy enterprise. Price relationships between milk and milk products and pork or other competing farm commodities also affect farmers' decisions as to choice of systems of farming.

Selection of combinations of crops and livestock enterprises that best meet the tests of highest net income and adequate conservation of soil is a major problem in soil conservation work. It is important in establishing conservation practices on those farms whose operators have previously paid little attention to erosion control. It is equally important for farmers who are practicing adequate erosion control, but for whom changes in technology or relative prices may make it advantageous to change combinations of crop and livestock enterprises.

THE BACKGROUND

From the time of the opening up of land in Wisconsin a hundred years ago until comparatively recently, farmers used cropping systems that they believed would provide satisfactory incomes, often with little concern for the loss of soil that might result. In normal times, their farm operations usually resulted in a comfortable level of living, even though soil erosion may have been severe. During the last generation, however, farmers became alert to the effects of loss of soil from their farms. They are now trying to save this valuable resource. Their recognition of the problem has frequently resulted in a conflict between their desire to prevent soil losses and their need for additional current income.

During the last decade, adoption of soil-conserving practices was fairly rapid in the western part of the State. Even so, protection against severe soil losses on many farms and in many areas is considered inadequate by soil technicians. This is true not only of farms on which no definite effort is made to conserve soil; it applies also to farms on which soil conservation plans are in effect but are not carried out effectively.

Soil losses have been severe and intensive soil conservation practices are needed on most farms in the State on which the Gale-Hixton soils complex prevails. These soils are concentrated in 2 areas. Nearly 2 million acres are in Eau Claire and the surrounding counties of west-central Wisconsin, and three-fourths of a million acres are in 56 townships

in Sauk, Richland, Juneau, Vernon, and Monroe Counties in the southwestern part of the State. Land in these areas is rolling to steeply rolling.

Included in the Gale-Hixton soils complex are the following soil conditions: (1) Gale silt loam - well drained, underlain at 2 to 3 feet by sand or sandstone, erosion a major problem; (2) Hixton sandy loam - formed from sandstone, siltstone and shale, underlain at about 2 feet by sand and some clay over sandstone, droughty, with erosion a problem to some extent; (3) Fayette silt loam - formed from loess, underlain at 3-1/2 feet or more by sand over sandstone, erosion a major problem; and (4) some very sandy soils and steep, very shallow soils over sandstone or limestone (Gale-Fayette-Norden-Hixton-Boone soils). Differences in the use of the land during a century of farming have resulted in differences in depths of topsoil and in soil texture, as well as in structure, even within soil types.

Soil conservation districts were established by the various county boards in the 5 counties listed, and in 1940 the U. S. Soil Conservation Service staffed offices to provide technical assistance. 2/ Farm conservation planning was well under way in 1941. The number of farmers who cooperated with the soil conservation districts in a conservation program increased steadily throughout the years until, on December 31, 1955, 5,819 farmers were listed as soil conservation district cooperators. They constituted 45 percent of all the farmers in the 5 districts (fig. 1).

WHY AND HOW THE STUDY WAS MADE

The study reported here was made to determine: (1) the amount of progress farmers have made in carrying out a conservation program, (2) the attitudes of farmers toward individual soil-conserving practices, and (3) the effect of the conservation program on crop and livestock production and on farm income. Information obtained from the study should help farm planners to improve the techniques of soil conservation planning and encourage farmers to increase the rate of application of soil-conserving practices.

Farms in the 5-county area on which Gale-Hixton soils were dominant and for which soil-survey maps and soil conservation farm plans were

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2/ Soil conservation districts were organized on a watershed basis following passage of the enabling act by the Wisconsin legislature in 1937. County Boards were empowered by 1939 amendments to the Districts law to establish soil conservation districts on a countywide basis.

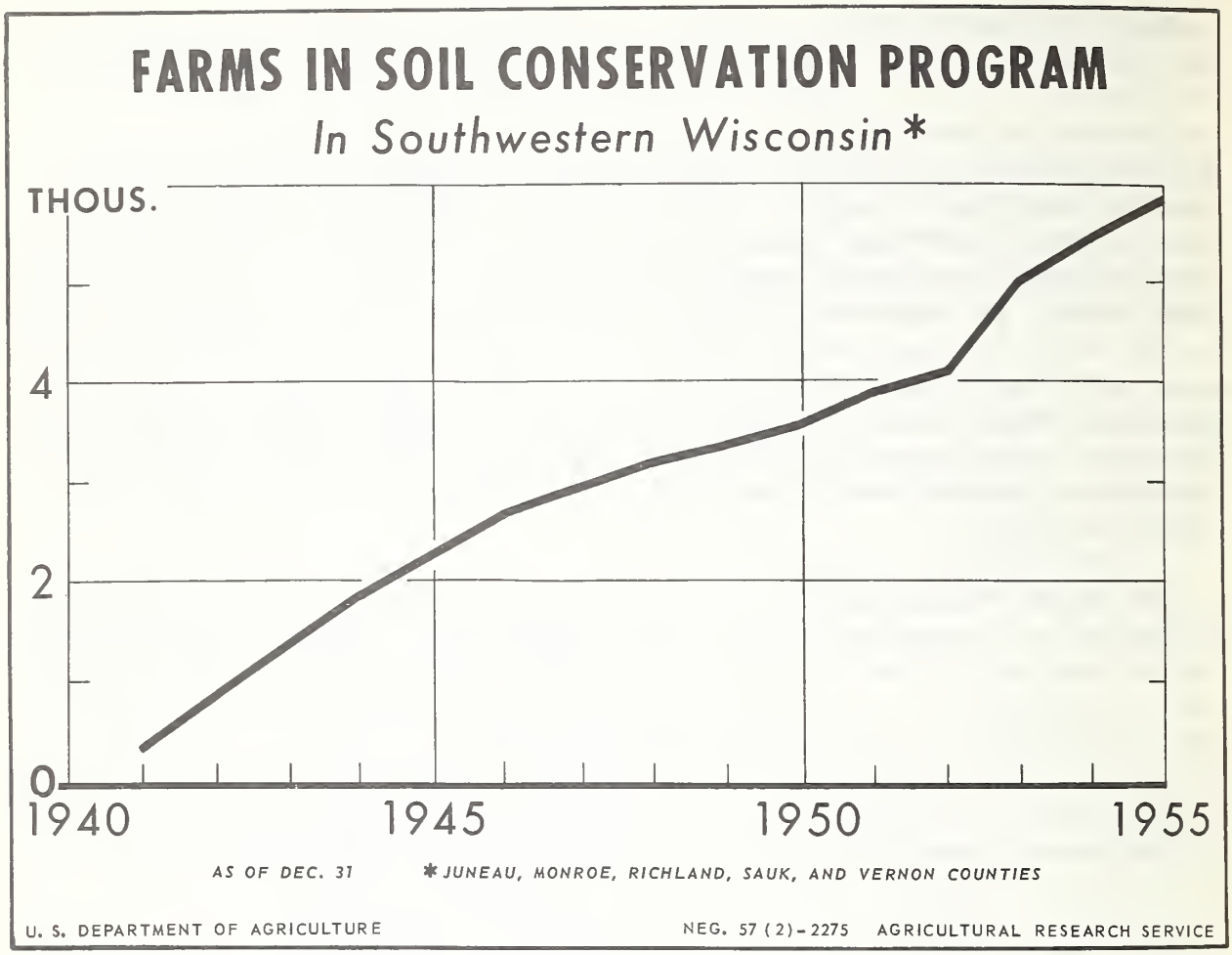

Figure 1

available were included in the study. In 1955, the survey enumerators obtained from each farmer information as to the extent of application of soil conservation practices. This information was checked against the farm soil conservation plans to determine the soil conservation rating for the farm. 3/ Farms that scored 85 and over in application of soil-conserving practices as described in the conservation plan for each farm were classified as high-conservation farms. Those with scores ranging from 70 to 84, inclusive, were classified as medium-conservation farms, and those scoring 69 and under, as low-conservation farms. On this basis, 48 farms fell in the high-conservation group, 44 farms in the

3/ The score card used in classifying the farm on the basis of adequacy of erosion control was developed in cooperation with the Region Three Staff of the Soil Conservation Service for surveys made in 1946 and in later years. See appendix, page 37.

medium-conservation group, and 35 farms in the low-conservation group. Compliance with soil conservation plans was greater than had been expected, hence the average conservation score for all farms was higher than had been anticipated.

Farms were also given erosion-hazard (land-capability) ratings based on the proportions of cropland in each land-capability class, as shown on soil survey maps. 4/ Erosion hazards were greater on cropland of farms in the high- and medium-conservation groups than on farms in the low-conservation group (table 1). In general, soil losses also had been greater

Table 1. - Characteristics of farms and farm operators, averages for farms grouped according to application of planned soil-conserving practices, 1954

Item	Conservation group			All farms in study
	High (48 farms)	Medium (44 farms)	Low (35 farms)	
Land capability rating	59	59	63	60
Age of operator	44	43	42	43
Number of workers per farm	1.3	1.3	1.4	1.3
Years in conservation program	10	8	5	8
Years operator had been aware of erosion	15	14	15	15
Acres of harvested crops per farm	70	68	74	70
Acres in farm	157	154	156	156

for the two former groups. This indicates that farmers on land subject to more severe erosion adopted conservation measures more readily than farmers on less erodible land. 5/

The high-, medium-, and low-conservation farms were similar as to age of farm operators, number of workers per farm, and the apparent

4/ See appendix for method of scoring.

5/ Actual measurements of soil losses have shown that there are serious soil losses on gentler slopes and on soils less susceptible to erosion that apparently are not recognized by the farm operators.

423787 O - 57 - 2

awareness by the operators of erosion problems on their farms. The three groups also had approximately the same average acreage per farm, but the low-conservation farms were almost 10 percent larger in terms of acreage of harvested crops than the farms in the medium-conservation group.

Analysis of the data was made for: (1) Farms grouped according to degree of acceptance of soil conservation practices, (2) farms grouped according to length of time that a soil-conserving system of farming had been followed, and (3) farms grouped according to land-capability rating.

APPLICATION OF SOIL CONSERVATION PRACTICES

Soil conservation plans for the individual farms were used as the criteria for soil conservation needs. The plans were developed by the farmers with help from the farm planners and were based on their mutual judgment as to the combinations of practices needed to control erosion adequately. In many instances, the plans were compromises between conservation needs and the conservation measures the farmer was willing to apply. It is possible that the recommended soil-conserving practices may have been more or less intensive than actually were needed for satisfactory conservation. However, it is felt that such minor discrepancies do not affect significantly the comparisons between groups.

The kind and extent of conservation practices called for in the plans developed for each farm were similar for the high-, medium-, and low-conservation farms (table 2).

Table 2. - Major items provided for in soil conservation plans, averages for farms grouped according to application of planned soil-conserving practices, 1954

Item	Unit	Conservation group		
		High (48 farms)	Medium (44 farms)	Low (35 farms)
Cropland in meadow 1/	Percent	62	62	62
Contour strips	Acres	54	53	55
Terraces	do.	4.8	1.4	4.2
Diversions	do.	4.2	4.0	4.7
Pasture renovation	do.	22.0	19.0	20.0
Protected woods	do.	24.0	17.0	19.0
Fertilizers	Ton	3.6	3.6	3.7
Limestone	do.	24.0	24.0	25.0

1/ Hay and rotation pasture.

The groups differed as to the average length of time that the operators had cooperated in a soil conservation district program. Farmers in the high-conservation group averaged 10 years in the program; those in the medium-conservation group, 8 years; and those in the low-conservation group, 5 years (fig. 2).

Rate of progress in applying an adequate erosion-control program varied considerably within each group. Eighty-eight percent of the high-conservation farmers had cooperated in a soil conservation district program for 7 years or more, although at least 4 percent of the group had achieved this end in 3 years or less. On the other hand, the time element apparently was not very important for the 30 percent of the farmers in the low-conservation group who in more than 6 years had established less than two-thirds of their planned practices. However, nearly half the farmers in the low-conservation group had been in the program for 3 years or less. Some of the reasons for the lag in application of the program are discussed later.

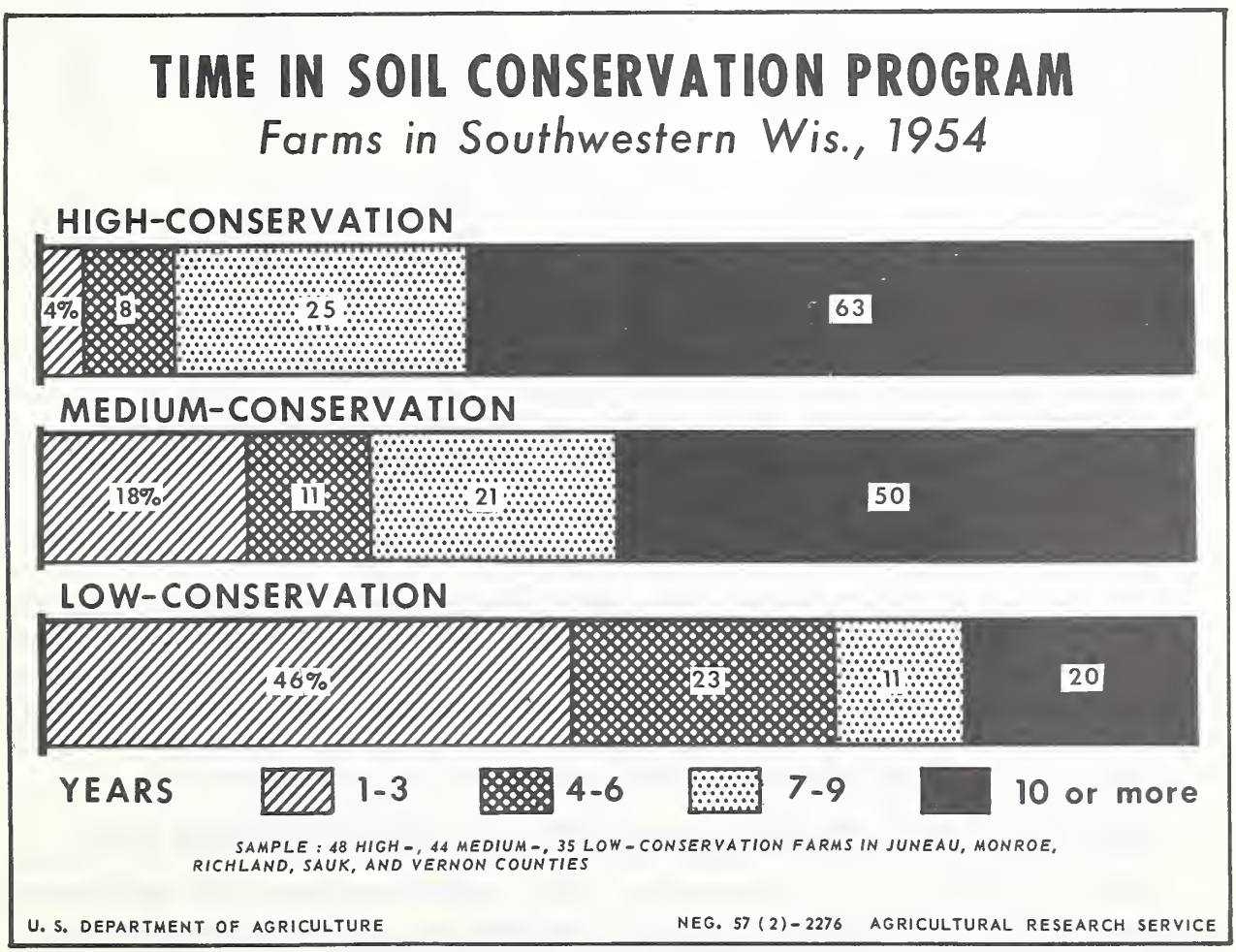

Figure 2

Compliance with soil conservation plans was greater for measures such as adequate proportions of hay crops, contour strip cropping, terraces, and diversions than for practices such as pasture renovation, protecting woodlots from grazing, or applications of lime (table 3). Of special

Table 3. - Percentage of farms on which specified practices were established, farms grouped according to application of planned soil-conserving practices, 1954

Practices	Conservation group			All farms in study
	High (48 farms)	Medium (44 farms)	Low (35 farms)	
	Percent	Percent	Percent	Percent
Crop rotation 1/	92	87	74	85
Contour strips	97	82	43	76
Terraces	97	83	26	71
Pasture renovation	45	47	12	38
Protected woods	56	52	56	55
Drainage	90	100	67	85
Application of commercial fertilizers	89	59	57	70
Application of lime	67	45	34	50
Average conservation score 2/	92	78	55	77

1/ Based on percentage of cropland in hay and rotation pasture.
2/ A description of the method used in computing soil conservation scores is given in the appendix.

interest is the low compliance with plans for pasture renovation, in view of the relatively high proportion of farmers who liked the practice. Establishment of terraces, diversions, and drainage was high because plans for these phases often were developed after one or more years of experience with the rest of the conservation program. Also, more direct help is given by the farm planner in the application of these practices.

RESPONSE TO VARIOUS PHASES OF THE CONSERVATION PLAN

Before complete soil conservation plans were developed for the farms, erosion control was limited largely to preventing gullies from developing and to increasing the proportion of hay crops to reduce sheet erosion. These

efforts were reported as starting practices by a relatively large number of farmers on the low-conservation farms (table 4). While farmers in the high- and medium-conservation groups may have utilized these practices as fully in the preconservation period, they regarded the establishment of contour strips and complete conservation programs as the beginning of erosion-control efforts on their farms. Evidence of second-generation conservation farming is found in the 4 percent of the farmers who reported that the program had been started on their farms by previous operators.

Contour stripcropping far outranked all other practices in popularity as a soil conservation measure. More than three-fourths of the operators listed it as a best-liked practice, and pasture renovation and terraces followed in order. Other practices rose in favor with farmers the more they were used.

Fewer farmers in the low-conservation group than in the other groups thought terraces were the most desirable way to conserve soil. A larger proportion of this group than of the others emphasized heavy applications of lime and commercial fertilizer as parts of an adequate erosion-control program.

Farmers rated pasture renovation second as a desirable part of the conservation program, but only 38 percent of the individual plans for this practice had been followed (table 3).

Sixty percent of the farmers reported that they had met with no material difficulties in following their farm conservation plans (table 4). Less than a fifth reported that they had had difficulty in working and pasturing contour strips, and about half that number said that it was difficult to follow the recommended cropping systems. More difficulty in following the cropping system was reported by farmers in the high-conservation group than by farmers in the other groups. Shorter rotations were used on the latter farms, and in this situation, less winter-killing of hay stands and fewer problems of shortage of hay or grain should be expected. Although only a small number of farmers said they had difficulty in renovating pastures, relatively few had completed their renovation programs. Farmers in the low-conservation group intended to apply more of the practices recommended in the conservation plan than they had been able to apply so far. These responses indicate that farmers like to start their conservation farming as simply as possible. They can then improve the program by adding terraces and diversions after they have had several years experience with contour strips.

More than half of the farmers reported no material handicaps in establishing soil conservation practices, but others encountered a number of

Table 4. - Percentage of farmers reporting experience in use of specific soil conservation practices and plans, farms grouped according to application of planned soil-conserving practices, 1954 1/

Item	Conservation group			All farmers interviewed (127)
	High (48 farmers)	Medium (44 farmers)	Low (35 farmers)	
	Percent	Percent	Percent	Percent
First conservation practice used on farm:				
Contour strips	37	35	30	34
Entire conservation plan	39	22	14	25
Fill ditches and gullies	10	9	11	11
Grass waterways	2	13	29	11
Increase in hay and pasture	10	15	38	19
Started by previous operator	2	9	7	5
Conservation practice best liked:				
Contour strips	82	80	74	78
Pasture renovation	22	9	13	14
Terraces	10	9	6	8
Lime and fertilizers	2	4	7	4
Most troublesome conservation practice:				
None	66	54	59	60
Contour strips	12	22	22	18
Crop rotation 2/	14	9	2	9
Pasture renovation	2	9	3	5
Cost of lime and fertilizers	2	4	3	3
Changes needed in conservation plan:				
None	72	72	54	67
Additional -				
Terraces	20	17	16	18
Contour strips	2	9	25	10
Hay acreage	6	7	8	7
Factors hampering conservation program:				
None	58	52	46	53
Lack of capital	30	41	35	35
Inadequate income (small farms)	4	0	8	4
Lack of time	20	11	19	17
Incentive payments too small	2	0	3	2

1/ Multiple answers account for percentages in excess of 100.

2/ Winter-killing, seeding failures, and lack of balance between roughage and grain.

problems. Lack of capital was listed by 35 percent of the farmers as a hindrance to the completion of their conservation programs. None, however, listed lack of credit as a factor in delaying the establishment of any conservation practice. Relatively few farmers indicated a desire to change their conservation plans to include additional terraces and diversions. Changes in cropping pattern, contour stripcropping and grass waterways usually require very little, if any, cash outlay above that needed in usual farm operations. The need for additional capital, then, stems largely from the need for purchases of lime, fertilizers, and seed for crops and pasture, and for changes in machinery and buildings that result from changes in crop rotations. Farmers were reluctant to go into debt for these and other expenditures involved in a soil conservation program for their farms.

Lack of time was mentioned by 17 percent of the operators as holding up completion of their conservation programs. Fewer than a half dozen farmers indicated that inadequate income and small acreages of cropland were handicaps to conservation farming. Only 2 farmers said that Government incentive payments were too small to induce farmers to accept soil-conserving practices and the same number said that such payments were helpful in getting soil conservation practices started on their farms.

HELP NEEDED IN CONSERVATION PLANNING AND APPLICATION

Because of the demand for technical assistance in planning and applying soil conservation practices, the opinions of farmers were sought regarding the kind of help needed. Without exception, they reported that technical help was needed in the preparation of individual farm plans (table 5). Eighty-five percent thought that a part or all of this help should be given on the farm in preparing conservation plans. Because of wide variations in land and other resources, they also believed that in most instances technical advice for specific practices must be given individual farm attention.

Most farmers thought that less assistance was needed in the application of practices than in their planning. Six farmers, all of whom were in the high-conservation group, believed that conservation practices could be applied without technical assistance although they wanted help in planning the practices. Probably, for these farmers, conservation farming had reached a routine stage by the time of the survey. More than four-fifths of the farmers thought they needed technical help in establishing contour strips. Many farmers thought that valuable general information could be obtained at group meetings.

Table 5. - Percentage of farmers who said they needed technical help in planning and applying specific soil conservation practices, 127 farms, 1954

Kind of help needed	Percentage of farmers reporting -	
	Planning	Application
	Percent	Percent
Preparation of farm plan	100	---
Individual assistance on the farm	68	---
Instructions at meetings	15	---
Combination of both	17	---
Crop rotations	93	49
Contour strips	99	82
Terraces 1/	32	29
Pasture renovation	57	23
Woodland management	38	9
Waterways	87	22
No help needed	0	14

1/ Only a third of the farmers believed that terraces were necessary and practical on their farms. All of them wanted technical assistance in planning and building their terrace systems.

LAND USE AND CROP PRODUCTION

The land use adjustments provided for in the farm conservation plans had been followed quite closely on all farms included in the study. In a few instances, small areas had not been converted from cropland to permanent pasture; and in other isolated instances, small acreages of woodland or permanent pasture that were suitable for cultivation had not been developed for crop production.

Acreage in Crops

Higher proportions of legume-grass hay and rotation pasture with lower proportions of corn and small grains characterize crop rotations on the high-conservation farms compared with rotations on the medium- and low-conservation farms (table 6). About 95 percent of the acreage of small grains was in oats. Corn silage needs usually are met first and the rest of the corn is used for grain. Approximately 5 acres of corn per farm were used for silage.

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PART 2 – INTERIM REPLY COPY

Table 6. - Average acreages in various land uses, farms grouped according to application of planned soil-conserving practices, 1954

Land use	High conservation group			All farms in study (127)
	High (48 farms)	Medium (44 farms)	Low (35 farms)	
	Acres	Acres	Acres	Acres
Hay	38.3	33.9	30.8	35.0
Corn	15.6	16.6	20.3	17.0
Small grain	15.5	16.6	21.1	17.5
Rotation pasture	3.8	5.7	5.9	5.0
Miscellaneous	.1	.4	1.7	.5
Total crops	73.3	73.2	79.8	75.0
Permanent pasture:				
Renovated	8.1	7.6	2.3	7.0
Open permanent	37.2	38.0	44.5	39.0
Woodland	22.4	21.5	16.7	21.0
Protected woodland	12.0	8.8	8.6	10.0
Other land	4.0	4.8	4.0	4.0
Farm total	157.0	153.9	155.9	156.0
	Percent	Percent	Percent	Percent
Percentage of cropland in hay and pasture	57	54	46	53

Farmers usually fitted their cropping programs to soil and slope conditions. Thus, on farms with relatively low land-capability ratings, having cropland most subject to erosion, a larger proportion of the acreage was in hay and rotation pasture than on the farms with medium or high land-capability ratings (table 7). 6/ The highest proportions of corn and small grains and the lowest proportions of hay and rotation pasture were found on farms with high land-capability ratings.

All of the farmers, regardless of the capability of their land, had larger acreages of corn and small grains and smaller acreages of hay and rotation pasture than usually are considered desirable in a satisfactory

6/ See appendix for explanation of method of scoring.

423787 O - 57 - 3

Table 7. - Average percentage of cropland used for hay and rotation pasture, farms grouped according to land capability, 1954

Item	Land-capability group		
	High (41 farms)	Medium (46 farms)	Low (40 farms)
Land-capability rating	70	59	50
	Percent	Percent	Percent
Percentage of cropland in meadow: 1/			
Recommended	60	63	67
Actual	49	55	58
Percentage compliance	82	87	87

1/ Meadow includes only biennial and perennial legumes and grasses used either for harvested forage or rotation pasture.

soil conservation program. Where contour strips, terraces, and diversions are used, crop rotations are usually corn-small grain-meadow-meadow-meadow-meadow, or 67 percent of cropland in meadow, on farms with a low land-capability rating, and corn-small grain-meadow-meadow-meadow, or 60 percent of the cropland in meadow, on farms with a high land-capability rating. Rotations for the medium land-capability group provide for keeping 63 percent of the cropland in meadow.

Types of Rotations

The crop rotation followed was a major factor in determining the level-of-conservation score for a farm. Approximately half the farmers in all three conservation groups used a 5-year corn-oats-meadow-meadow-meadow rotation (table 8).

The high-conservation farmers used rotations with high proportions of meadow more often than the low-conservation farmers. In contrast, more than a third of the low-conservation farmers used a corn-oats-meadow rotation.

Evaluation of Cropping Systems

Three-fourths of the farmers said they had no difficulty in adopting the cropping system provided for in their conservation plans (table 9).

Table 8. - Percentage of farms with specified types of rotations, farms grouped according to application of planned soil-conserving practices, 1954 1/

Type of rotation	Conservation group			All farms in study (127)
	High (48 farms)	Medium (44 farms)	Low (35 farms)	
	Percent	Percent	Percent	Percent
Corn, oats, meadow	2	11	35	14
Corn, oats, meadow, meadow	34	43	57	44
Corn, oats, 3 years of meadow	44	52	46	48
Corn, oats, 4 years of meadow	22	20	8	17
Oats, 2-5 years of meadow	10	7	5	7

1/ Multiple answers account for percentages in excess of 100.

Table 9. - Farmers' opinions of soil-conserving rotations, 127 farms, 1954

Item	Percentage of farmers reporting
	Percent
Problems caused by adopting soil-conserving rotation:	
None	75
Seeding failures	9
Winter-killing of meadows	3
Lack of forage-grain balance	8
Increase in peak labor load	8
Most desirable feature of rotation:	
Increases yields	1/ 37
Reduces soil losses	1/ 32
Increases forage	12
Makes contour strips practical	13
Adequate erosion control	96

1/ Increases in yields and reduced soil losses were reported by 84 percent, 72 percent, and 58 percent of the high-, medium-, and low-conservation groups, respectively.

However, they frequently omitted one year of meadow from the planned rotation. For example, on farms for which 6-year rotations, including 4 years of meadow, were planned, an average of only 56 percent of the cropland actually was in meadow compared with the 67 percent provided for in the conservation plans. Proposals to increase the proportion of meadow to more than 50 percent of the cropland meet with considerable resistance from many farmers. This resistance comes chiefly because of four types of obstacles: (1) Barn space cannot accommodate more dairy or other roughage-consuming livestock; (2) grain production does not meet the needs of the livestock that the farmer wants to raise; (3) it is difficult to maintain good stands of legumes over several winters; and (4) an increase in meadow creates peak labor loads at haying time or requires high investment costs for more efficient haying machinery.

Increased yields of crops and reduced soil losses were cited by 69 percent of the farmers as "the best features" of soil-conserving rotations. "Adequate" erosion control was obtained with the rotations now in the farm plan, according to 96 percent of the farmers.

Fifty-four percent of the farmers reported that meadows had remained productive for 3 years without reseeding, and nearly a third said that they would have to reseed after 4 years of meadow. On nearly half of the farms, meadows were plowed up to maintain rotations rather than because of winter-killing of stands. Late fall pasturing had damaged stands or caused legumes to winter-kill on 40 percent of the farms.

Maintenance of meadow stands for 3 or 4 years continues to be a problem. However, use of new, more winter-hardy varieties of legumes, and heavier applications of lime and commercial fertilizers, may alleviate this difficulty. Also, as farm equipment wears out, it will be replaced with equipment that is better adapted to production and harvesting of the crops recommended in the conservation plans.

Yields of Crops

Crop yields on the high-conservation farms were 7 percent higher than the average for all farms, and were about 10 percent below average on the low-conservation farms (table 10). Furthermore, the high-conservation farm soils were more erodible, and had lost more cropland topsoil than the low-conservation farms at the time the conservation plans were made. Had the groups been more nearly comparable in depth of topsoil, differences in yields probably would have been greater.

Table 10. - Crop yields and application of commercial fertilizer, average for farms grouped according to application of planned soil-conserving practices, 1954

Item	Unit	Conservation group			All farms in study (127)
		High (48 farms)	Medium (44 farms)	Low (35 farms)	
Hay	Ton	2.6	2.3	2.2	2.4
Corn silage	do.	11.8	11.0	9.4	10.8
Corn	Bushel	80	74	68	74
Oats	do.	48	47	39	45
Crop yield index 1/	---	107	101	90	100
Commercial fertilizer per farm	Ton	3.2	2.2	2.2	2.6

1/ See appendix for method used in computing crop index.

UTILIZATION OF GRASS SILAGE

Ensiling a part of the hay crop is an effective means of utilizing production from the larger acreages of meadow usually included in the conservation plans. The substitution of grass silage for corn silage also makes corn available for feed in the form of grain. Utilization of the crop as grass silage, therefore, goes hand in hand with a conservation program that includes increases in the acreage of meadow.

Almost 90 percent of the high-conservation farmers put up and fed grass silage as compared with about 70 percent of the medium-conservation farmers and 57 percent of the low-conservation group (table 11). Forty-three percent of these farmers continued to harvest and feed grass silage in each year after they began the practice, while almost the same proportion discontinued it after a trial of a year or two.

Most farmers who stopped putting up grass silage listed one of these three reasons for doing so: Inadequate facilities, shortage of hay, or poor quality or excessive spoilage of feed. A few gave decreased milk production as a reason for changing back to corn silage and others liked corn silage better than grass silage.

Almost three-fourths of the farmers increased the grain allowance per cow when grass silage replaced corn silage in the ration, and less

Table 11. - Farmers' experiences with grass silage, 91 farms, 1954 1/

Item	Percentage of farmers reporting	Item	Percentage of farmers reporting
	Percent		Percent
Continued using grass silage -		Effect on milk production of changing from corn silage to grass silage:	
Almost every year	43	Decrease in milk	40
Half the years	17	No change in milk	43
Missed most years	40	Increase in milk	17
Reasons for discontinuing grass silage:		Cows lost weight	6
Inadequate facilities 2/	28	Change in ration when grass silage replaces corn silage:	
Shortage of hay	33	Hay:	
Poor quality, silage - spoilage	30	More fed	6
Decreased milk production	13	Less fed	18
Prefer corn silage	7	Grain:	
Quality of silage:		More fed	64
Very good	7	Less fed	4
Good	50	Protein supplements:	
Fair	27	More fed	5
Poor	16	Less fed	44

1/ Includes operators of 43 high-conservation farms, 28 medium-conservation farms, and 20 low-conservation farms.

2/ Inadequate silo, lack of machinery or labor.

than half reduced protein supplements. Almost one-fifth decreased the hay in the ration, although a few increased it when making the shift to grass silage. Opinions varied considerably as to the effects of feeding grass silage. Differences in results probably were due chiefly to differences in quality of the silage and to differences in hay, grain, and protein supplements fed.

IMPROVEMENT OF PASTURES

Renovation of Pastures

Permanent bluegrass pastures in this area are not very productive, especially during the hot summer months. Renovation of these pastures

through tillage (usually with a field-cultivator type of machine), liming, fertilizing, and seeding of alfalfa, red clover, and other legumes results in greatly increased production of forage. In recent years, this method of seedbed preparation and seeding has been used also on rotation pastures by many farmers in Wisconsin. Thus, the term "pasture renovation" is applied to both the reseeding of rotation pastures and the improvement of permanent pastures.

Although the farmers interviewed rated pasture renovation as one of the most important parts of a farm conservation plan, only 78 of the 127 farmers had renovated any pasture areas. Only 24 percent had completed the renovation program begun (table 12). Ninety-one percent of those who had started a renovation program said they had completed or intended to complete it. Only 2 of the 127 farmers regularly re-renovate their permanent pastures to maintain good stands of legumes.

Carrying Capacity of Pastures

It was the general belief of the farmers interviewed that renovation of open permanent pasture more than doubled its carrying capacity and increased the length of the grazing season by a fourth (table 13). They believed that renovation placed the feed-producing value of open permanent pasture on an equal with rotation pasture. Woodland pasture appears to have less than one-tenth of the feed-producing value of rotation pasture.

SUPPLEMENTARY SOIL-CONSERVING PRACTICES

Ungrazed woodlots and well-managed permanent pastures usually provide excellent protection against soil losses. Crop rotations provide adequate safeguards against soil losses for cropland when the rotations contain a sufficient proportion of perennial meadow crops. Supplementary or supporting soil-conserving practices such as contour strips, terraces, diversions, and grass waterways are used when rotations are such that adequate prevention of soil losses cannot be obtained from vegetative cover alone. Utilization of supplementary practices gives the farmer a much greater choice as to the type of farming he can follow than reliance on vegetative cover as the only means of soil conservation.

Contour Strips

Contour strips were used by all except one of the 127 farmers interviewed. Installation of strips provided for in the conservation plans was 98 percent completed on the high-conservation farms as compared with 84 percent on the medium-conservation farms and 76 percent on the low-conservation farms. Strips were installed on an average of 42 acres of cropland per farm (table 14). This included approximately three-fourths,

Table 12. - Pasture renovation: Extent, quantities of lime and fertilizer used, kind of machinery used, and reasons for not completing program, 78 farms, 1954 1/

Item	Unit	Amount
Areas renovated	Number	137
Areas renovated per field	do.	6
Lime application per acre	Pound	4,128
Fertilizer application per acre	do.	235
Percentage of farmers who -		
Have completed renovation	Percent	24
Will complete renovation 2/	do.	91
Have re-renovated	do.	14
Use complete fertilizer	do.	39
Use phosphate-potash fertilizer	do.	53
Use -		
Field cultivator	do.	74
Plow	do.	17
Disk	do.	29
Spring tooth harrow	do.	8
Gave as reason for not having completed renovation planned:		
Lack of time	do.	41
High cost	do.	28
Lack of machinery	do.	13
Does not last	do.	1
Land too steep	do.	9
Have sufficient pasture	do.	8

1/ Includes 33 high-conservation farms; 32 medium-conservation farms; and 13 low-conservation farms.

2/ Includes both the farmers who had completed renovation provided in the farm plan and those who still planned to do so.

two-thirds, and one-third, respectively, of the crop acreage on the high-, medium-, and low-conservation farms. Ninety-three percent of the farmers reported that contour strips were satisfactory as part of an erosion-control program. Very few had made or planned to make changes in the first layout of strips (table 15).

Table 13. - Averages of farmers' estimates of carrying capacity of pastures and length of pasture season, by type of pasture, 127 farms, 1954

Type of pasture	Acres per cow	Cows per 100 acres	Months per season
Renovated open permanent	1.3	77	4.4
Rotation	1.4	72	4.9
Open permanent	3.1	32	3.7
Woodland	8.3	12	3.3

Table 14. - Progress farmers have made in installing stripcropping, terraces, and diversion terraces provided for in soil conservation farm plans, 1954

Item	Unit	Progress reported
Contour strips (126 farms):		
Average installed per farm	Acre	42
Average width of strips	Feet	74
Average length of slope	do.	442
Percentage of farmers reporting:		
Layout of strips completed	Percent	86
Erosion control adequate	do.	93
Terraces (20 farms):		
Farms on which terraces completed	Number	18
Acreages terraced per farm	Acre	16
Length of terrace per acre	Feet	145
Percentage of farmers who considered erosion control adequate	Percent	100
Diversion terraces (40 farms):		
Farms on which diversions completed	Number	35
Length of diversion installed:		
Per farm	Feet	1,060
Per acre	do.	98
Percentage of farmers who considered erosion control adequate	Percent	100

Table 15. - Percentage of farmers reporting changes made or to be made in contour strips, terraces, and diversion terraces provided for in soil conservation farm plans, 1954

Item	Percentage reporting change -	
	Already made	To be made
	Percent	Percent
Contour strips (126 farmers reporting):		
Widen strips and decrease number	9	2
Smooth out curves	12	6
Lengthen or shorten strips	3	2
Reduce width and increase number	2	6
Rearrange strips	3	0
Discontinue strips and use permanent cover	0	2
Terraces (20 farmers reporting):		
Additional work	5	0
Repairs	1	0
Terrace other fields	0	20
Diversion terraces (40 farmers reporting):		
Additional work	2	8
Rebuild outlets	0	2
Improve grade or capacity	2	5
Build more diversions	0	15

Effective contour strips frequently require only minor changes in field layout. The additional time, if any, required to make the changes in field layout and to till the crops where changes have been made is not important in this area. The wide acceptance and application of contour strips indicate their practicability.

One or more of three reasons were usually given for the lag between the planning and the laying out of contour strips. Most common was lack of time on the part of the cooperators to get the job done. Also, uneven or irregular topography sometimes resulted in irregularly shaped strips that were inconvenient to work; and farm boundary lines frequently cut strips into lengths that were too short to work efficiently. The latter problems require individual solution, but as farmers gain experience they are able to work out satisfactory solutions for their special situations with the aid of the farm planner. Many farmers who had partially

completed laying out contour strips indicated that they expected to complete the job as soon as possible.

Terraces and Diversions 7/

Slopes must be fairly uniform and outlets must be available if terraces and diversions are to be practical. Terraces usually have not proved practical in this area for slopes of more than 12 percent. Diversions can be used under a wider range of slope conditions. Terraces and diversions require a much more drastic change in tillage operations than just working on the contour. If they are improperly built or inadequately maintained, they involve hazards, and once built they become more nearly a permanent feature of the land. Because of these problems, and the additional cost involved, farmers want more proof of the practicability of these practices for their specific situations than of other less drastic measures.

Twice as many farmers had installed diversions as had installed regular field terraces (table 14). All of the 51 farmers who had built either terraces or diversions on their farms found them to be satisfactory, and 10 others planned to build them. Interest in these practices is growing because their use increases the range of crop and livestock enterprises that can be combined with adequate erosion control.

Twenty percent of the farmers who had terraced fields planned to terrace other fields, while 15 percent of those who had installed diversions planned additional diversions (table 15). Very little additional work in the repair or improvement of terraces or diversions had been necessary.

Grass Waterways

Grass waterways are not new to farmers in this area. In general, however, most of those in existence before adoption of soil conservation

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7/ Terraces are channels constructed across slopes to intercept runoff and conduct it to safe outlets. Usually they are constructed in a series at specified vertical spacings and are cropped. Diversions are individually designed channels constructed across the slope to intercept runoff and conduct it to safe outlets. Usually, they are constructed on slopes that are too steep for terraces and ordinarily they are used in connection with contour strips to carry off the heavy overburden of water before it reaches lower cultivated slopes. In this area, diversion channels are kept in sod continuously because they are constructed with larger capacities and for greater water velocities than regular terraces.

programs were too narrow to prevent gullies from forming. They tend to build channels on either side of the grass through siltation within the channel, unless special attention is paid to their maintenance. The number of grass waterways was increased on approximately a fifth of the farms. A few farmers reported that, after installing terraces and diversions and increasing the acreage of hay, they found that some of the grass waterways were not necessary and eliminated them. More grass waterways were needed on farms where the acreages of row crops or small grains were increased. There were no significant differences in width of grass waterways from the width as planned and as installed.

FERTILIZERS AND LIME

Fertilizers were generally applied to increase crop yields rather than to prevent soil loss through improving land cover. Commercial fertilizers were applied in 1954 by 91 percent of the farmers. The fertilizers were used largely on corn and oats at a rate of 148 pounds per acre for corn and 138 pounds per acre for oats (table 16). These rates are much less than are recommended; however, many farmers are making heavier applications of fertilizer now than they thought necessary a few years ago. Lack of capital appears to be a major reason for failure to apply more fertilizer. Neither do farmers have sufficient information to determine the most profitable rate of fertilizer application for their individual farms or fields. Also, they have few guides to help them determine the comparative advantage in income of investing in fertilizer or of using their limited resources for other purposes.

Mixed fertilizers made up 95 percent of all fertilizers applied on corn, with 3-12-12 comprising 39 percent of the total applied. Other mixtures used were 5-20-20, 4-16-16, and 10-10-10. These mixtures made up 26, 21, and 9 percent of the total, respectively. Phosphate-potash mixtures made up 64 percent of the fertilizers used on small grains, with 3-12-12 accounting for 20 percent of the total. The average crop-yield indexes were 93, 100, and 108 for farms using less than 50, 50 to 99, and 100 or more pounds of fertilizer per crop acre (table 17).

In 1954, only 56 percent of the farmers applied lime. The average rate of application per acre of crops was 343 pounds of ground limestone. This is only about half the amount required annually to maintain the proper PH level on these soils. No information was obtained as to previous applications of lime or as to the PH level of the soil in 1954.

WOODLANDS

Woodlot management programs are handicapped because of the lag in time between investments in fencing, replanting, taxes, and other costs

Table 16. - Proportion of farmers using fertilizer on specified crops, and rate of application, 127 farms, 1954

Crop	Farmers using fertilizers	Rate per acre
	Percent	Pounds
Corn	87	148
Oats	73	138

Table 17. - Yields of crops, farms grouped according to amount of commercial fertilizer applied per crop acre, 1954

Item	Unit	Pounds of fertilizer per crop acre		
		0-49	50-99	100 and more
Number of farms	---	37	59	31
Land-capability index	---	61	59	62
Commercial fertilizer per acre	Pound	27	76	123
Yield per acre:				
Hay	Ton	2.2	2.4	2.6
Oats	Bushel	42	44	47
Corn	do.	80	73	82
Corn silage	Ton	10.2	10.6	11.6
Crop-yield index	---	93	100	108

and returns from the timber harvest. As a result, the farmer usually places a low priority on allocating time and other resources to woodland-management programs. Only about a third of the 31 acres of woodland per farm was protected from grazing (table 6). Woodland grazing has a lower carrying capacity for livestock than open pasture. At the same time, considerable damage is done to young trees. Approximately a third of the farmers built new fences to protect woodlots from grazing. This construction averaged 135 rods per farm.

Farm operators filled most of their fence post and fuelwood needs from their farm woodlands. In addition, considerable quantities of logs, ties, and lumber were harvested for farm use and for sale (table 18).

Table 18.- Use and value per farm of timber from farm woodlands, 127 farms, 1954

Item	Unit of production	Quantity	Value 1/
			Dollars
Fence posts	Number	119	23.80
Fuelwood	Cords	24	120.00
Logs	Board feet	388	11.64
Ties	Number	13	13.00
Lumber	Board feet	1,698	67.92
Total value	---	---	236.36

1/ Prices per unit as follows: Posts 20¢; fuel $5.00; logs 3¢; ties $1.00, and lumber 4¢.

WILDLIFE

Wildlife areas on the farms consisted chiefly of woodlands and scattered plantings in odd-shaped areas and along fence rows. A third of the farmers reported an average of 18 acres per farm in specific wildlife areas. All of them planned to continue to maintain areas for the protection, feeding, and use of wildlife.

LIVESTOCK PRODUCTION

The number of animal units per farm was directly related to the extent of application of soil-conserving practices. Thus, the high-conservation farms had 36 productive animal units per farm compared with 31 on the low-conservation farms. Further comparison shows that there were 43 animal units per 100 acres of cropland on the low-conservation farms and 53 on the high-conservation farms (table 19). Dairy cattle comprised 86 percent of the productive animal units on both the high- and low-conservation farms. Milk sales per cow were higher on the high-conservation farms.

Table 19. - Animal units of livestock, and milk sales per cow, farms grouped according to application of planned soil-conserving practices, 1954 1/

Class of livestock	Conservation group			All farms in study (127)
	High (48 farms)	Medium (44 farms)	Low (35 farms)	
	Animal units	Animal units	Animal units	Animal units
Productive animal units per farm:				
Cows	22.2	21.2	18.8	21.0
Other dairy cattle	8.6	8.2	7.5	8.1
Hogs	3.5	3.0	3.2	3.2
Hens	1.2	1.1	1.1	1.1
Sheep	.3	.0	.1	.1
Total	35.8	33.5	30.7	33.5
Horses per farm	.7	.6	1.0	.7
Animal units per 100 acres of crops	53.0	51.0	43.0	49.0
	Cwt.	Cwt.	Cwt.	Cwt.
Milk sales per cow	72.6	68.9	65.5	69.2

1/ One animal unit is equal to 1 cow, 2 head of other dairy cattle, 1,500 pounds of hogs produced, 100 hens, 10 sheep, or one horse.

Most farmers in the study reported a satisfactory balance between production of forage and grain feed after adoption of the soil-conserving system of farming (table 20). The low-conservation farmers reported less difficulty with surplus forage production than did those in the medium- and high-conservation groups. This was due largely to the smaller proportion of hay crops in the rotation (table 6).

Where acreages of corn and small grain were decreased when farmers shifted to conservation farming, the total production of grain was usually maintained, because the decreases in acreage were offset by higher yields per acre. The increased acreage of meadow did increase production of roughage in relation to grain production. A few farmers bought more concentrates to supplement the grain production.

Table 20. - Percentage of farmers reporting specified effects of conservation program on crop production and livestock feeding practices, farms grouped according to application of planned soil-conserving practices, 1954

Item	Conservation group			All farmers reporting (127)
	High (48 farmers	Medium (44 farmers	Low (35 farmers	
	Percent	Percent	Percent	Percent
Satisfactory forage-grain balance	86	80	92	86
Hay in excess of needs	14	20	8	14
Decrease in corn acreage	32	36	27	32
Increase in yield of corn offsets acreage decrease	30	33	27	30
More concentrates bought	2	3	0	2
Changes in dairy ration:				
Decreased protein supplements	46	42	29	40
Increased hay	48	42	29	41
Increased concentrates	16	7	6	10
Decreased grain	4	4	6	5

The principal changes in feeding practices that resulted from adoption of soil conservation farming were the decrease of protein supplements in the ration and the increase of forages such as hay (table 20) and grass silage (table 11).

FARM INCOME AND EXPENSES

For the 88 farms on which financial records were available, average net farm income was about 10 percent higher on the high-conservation farms than on the low- and medium-conservation farms. Net farm income averaged slightly lower on the medium-conservation farms than on the low-conservation farms (table 21). However, the net farm income per crop acre was higher on the medium-conservation farms than on the low-conservation farms.

Table 21. - Farm income and expenses, average for farms grouped according to application of planned soil-conserving practices, 88 farms, 1954 1/

Item	Conservation group			All farms included (88)
	High (34 farms)	Medium (32 farms)	Low (22 farms)	
Land-capability rating	59	59	65	60
Soil conservation score	91	78	56	78
	Acres	Acres	Acres	Acres
Land in crops	74	66	73	71
	Dollars	Dollars	Dollars	Dollars
Farm income:				
Livestock sales	1,888	1,370	1,906	1,704
Sales of products	4,998	4,576	4,143	4,631
Other income	349	246	264	290
Total farm income	7,235	6,192	6,313	6,625
Farm expenses:				
Cash	4,179	3,703	3,702	3,887
Noncash	950	619	709	769
Total farm expenses	5,129	4,322	4,411	4,656
Net farm income	2,106	1,870	1,902	1,969
Net farm income per crop acre	28.46	28.33	26.05	27.73

1/ Farms on which farm records were available.

TIME AS A FACTOR IN SOIL CONSERVATION

The attitudes and opinions of farmers regarding various soil-conserving practices change as they gain experience with conservation programs. Contour strips, terraces, and pasture renovation were considered the best conservation practices by a larger proportion of farmers who had followed a conservation program for 7 years or more than of farmers with less experience with these practices (table 22). In contrast, the application of lime and commercial fertilizer was best liked by a larger proportion of the farmers with less experience in conservation farming. Farmers in the longer experience group raised larger acreages of hay.

Table 22. - Proportion of farmers who liked specific practices best and who had problems with certain practices, farmers grouped according to number of years soil conservation program had been followed, 1954 1/

Item	Number of years in program: 7 or more (84 farmers)	Number of years in program: 6 or less (43 farmers)
	Percent	Percent
Best liked practice:		
Contour strips	83	68
Terraces	10	4
Pasture renovation	19	8
Lime and commercial fertilizer	2	8
Most difficult problem:		
Contour strips	15	22
Pasture renovation	5	8
Surplus hay	10	0
Conservation program hampered by:		
No problems	56	43
Lack of capital	30	43
Lack of time	18	14
Lack of credit	0	0

1/ Multiple answers account for percentage totals in excess of 100.

Farmers listed as their most difficult problems those encountered in connection with contour strips, pasture renovation, and surplus hay. The surplus hay problem increased with the increase in acreage of meadow provided for in the conservation plans.

In time, farmers are able to solve many of the problems incident to adoption of soil-conserving practices. Fifty-six percent of the farmers who had been in the soil conservation district program at least 7 years, as contrasted with 43 percent of the farmers who had been in the program less than 7 years, reported no material handicaps in getting their conservation programs established. Thirty percent of the former group as compared with 43 percent of the latter reported that lack of capital slowed up their conservation program. However, none in either group indicated that lack of credit hampered the program. This indicates a reluctance in both groups to use credit to finance conservation farming.

Insufficient lapse of time was reported as a factor by almost a fifth of the farmers. Several years are needed in which to make changes in cropping systems on some farms and still more time is needed to adjust livestock production to the changed feed supply. A number of operators also reported that they did not have the time themselves or could not provide the labor to renovate pastures or lay out contour strips, or to apply other conservation practices.

Changes in Conservation Practices

Farmers have made adjustments in the soil-conserving practices provided in their original plans. More farmers among the long-term conservationists than among the newcomers had made changes in planned practices, particularly in the use of contour strips (table 23). This difference may have arisen because (1) farmer and planner experiences in earlier planning were helpful in improving conservation planning in later years, (2) more recent plans were made to fit current crop production technology, and (3) operators of more recently planned farms have not had time to make adjustments that may be needed.

Table 23. - Practices carried out as planned, and changes made in specific soil conservation practices, farms grouped according to years in soil conservation program, 1954

Item	Number of years in program	
	7 or more (84 farms)	6 or less (43 farms)
	Percent	Percent
Contour strips:		
Laid out as planned	90	82
Changes made to date	28	15
Changes to be made	11	14
Terraces laid out as planned	99	15
Diversions laid out as planned	79	100

Virtually all terrace construction had been completed as planned by farmers who have been in the conservation program for 7 years or more. Most of this work was still to be done by the more recent cooperators in the program. On the other hand, the planned construction of diversions had been more fully completed on the latter farms. Probably this was because of a more ready acceptance by recent cooperators who had

observed the success of diversions on other farms. The farm planners, therefore, could lay out the diversions at the time other phases of the conservation plan were developed.

Effect on Crop Yields

Yields of crops varied directly with the number of years soil conservation practices had been followed (table 24). Farmers in both the 7- to 9-year and 10-year and more groups had achieved average conservation

Table 24. - Crop yields, farms grouped according to years in soil conservation program, 1954

Item	Unit	Number of years in program			
		10 and more (59 farms)	7-9 (25 farms)	4-6 (17 farms)	1-3 (26 farms)
Conservation score	---	83	83	72	63
Land-capability index	---	59	60	60	62
Yield per acre:					
Hay	Ton	2.6	2.3	2.3	2.0
Corn	Bushel	78.5	74.0	63.2	68.5
Corn silage	Ton	11.8	11.1	10.4	9.2
Oats	Bushel	50.2	45.2	40.3	36.0
Crop-yield index	---	109	100	93	84
Corn-yield index	---	108	101	90	90
Commercial fertilizer per farm	Ton	2.6	2.9	2.4	2.5

scores of 83, but average yields were 9 percent higher for the long-term conservation farmers. The crop-yield index ranged from 84 for the 1- to 3-year group to 109 for the 10-year and more group. Yield of corn was 10 bushels higher for the latter group than for the former. Differences in yield were the result of both the degree of application of soil-conserving practices and the length of time that these practices had been used.

Effect on Livestock Numbers

The general effect of the program on the livestock enterprise was an increase in numbers of dairy and beef cattle and a slight decrease in numbers of hogs, sheep, and poultry (table 25). Also, the total number of productive animal units was increased. Farmers made these adjustments to utilize the increased production of roughages in relation to grains. Adjustments in livestock numbers were not made as rapidly as adjustments in land use and feed production. A part of this lag occurred because many farmers provide increases in cattle from their own herds. Also, they wanted to be certain of the increase in feed before they increased their livestock numbers.

Effect on Farm Income and Expenses

Differences in gross and net income among the four groups of farms follow the same pattern as differences in crop yields and livestock numbers (table 26). Net incomes per acre averaged approximately $1.00 higher for each additional year under a soil-conserving system of farming.

Table 25. - Productive animal units per farm, farms grouped according to number of years in a soil-conserving program, 116 farms, 1954 1/

Class of livestock	Number of years in program							
	10 and more (59 farms)		7-9 (19 farms)		4-6 (18 farms)		1-3 (20 farms)	
	Before program	1954	Before program	1954	Before program	1954	Before program	1954
	Animal units							
Dairy cows	18.5	22.0	20.6	22.4	17.8	19.8	17.6	18.4
Other cattle	6.4	8.6	5.5	7.1	6.2	7.2	6.6	7.8
Hogs	4.1	3.2	3.4	3.9	3.4	3.0	2.9	2.9
Sheep	.7	.2	.0	.0	.0	.0	.2	.2
Hens	1.4	1.2	1.3	1.4	1.3	.9	1.1	1.1
Total	31.1	35.2	30.8	34.8	28.7	30.9	28.4	30.4

1/ Farms for which preconservation data were available.

Table 26. - Farm income and expenses, farms grouped according to years in a soil-conserving program, 88 farms, 1954 1/

Item	Number of years in program			
	10 and more (41 farms)	7-9 (17 farms)	4-6 (13 farms)	1-3 (17 farms)
	Acres	Acres	Acres	Acres
Crop acreage	68	74	73	71
	Dollars	Dollars	Dollars	Dollars
Farm income	6,970	6,761	6,553	5,524
Farm expenses	4,825	4,701	4,783	3,944
Net farm income	2,145	2,060	1,770	1,580
Net farm income per crop acre	31.54	27.84	24.25	22.25

1/ Farms for which financial records were available.

APPENDIX

Method of Computing Soil Conservation Score

The soil conservation score is a weighted average of the percentage of application of planned soil-conserving practices for each farm. The procedure for computing soil conservation scores was developed by the Soil Conservation Service for use in conservation benefit surveys made in 1946. The weighting for specific conservation practices was adapted by the Regional Office of the Soil Conservation Service at Milwaukee to fit Wisconsin conditions. The following example illustrates the method used in developing the conservation score for each farm.

Practice	Unit	Needed	Applied 1954	Merit points: Per unit	Merit points: Desirable	Merit points: Actual
1. Soil-conserving crop rotation	Acre	70	70	1/ 11-10	770	700
2. Contour strip cropping	do.	55	50	8	440	400
3. Terraces	do.	10	10	20	200	200
4. Diversions	100 feet	800	900	10	80	90
5. Fertilizers	Ton	3	2.7	30	90	81
6. Lime	do.	25	22	3	75	66
7. Pasture renovation	Acre	20	16	3	60	48
8. Drainage	do.	10	10	2/ 8	80	80
Total	---	---	---	---	1,795	1,665
Conservation score (percent)					100	93

1/ The amount of protection against soil losses afforded by crops grown depends to a large extent upon how much of the cropland is in meadows. In the evaluation of the soil-conserving features of cropping systems, the number of merit points per acre is increased as the proportion of meadow in the rotation increases. The number of acres of cropland is multiplied by a factor assigned for the specific range in percentage of cropland in meadow as shown below:

Percentage of meadow		Merit points	Percentage of meadow		Merit points
33-35	=	5	48-52	=	9
36-38	=	6	53-57	=	10
39-42	=	7	58-63	=	11
43-47	=	8	64 and more	=	12

2/ Drainage to improve:
Noncropland for crop production-------20 points
Poorly drained cropland ---------- 8 "
Poorly drained permanent pasture ----- 4 "

Method of Computing Land-Capability Rating

Land-capability rating as used here is a measure of average erosion hazards for cropland on each farm. This system of rating was developed in 1940 by H. O. Anderson and D. M. Keyes with the assistance of soil scientists and agronomists of the Soil Conservation Service. The procedure used is illustrated in the example shown below:

Land capability class	Acres	Percent		Weight		Rating
I	8	10	x	1.0	=	10.0
II	16	20	x	.9	=	18.0
III	32	40	x	.7	=	28.0
IV	12	15	x	.5	=	7.5
V	4	5	x	.5	=	2.5
VI	8	10	x	.3	=	3.0
VII	0	0	x	.1	=	0
Total	80	---		---		69.0

Method of Computing Crop-Yield Index

The crop-yield index is computed as illustrated in the example below:

Crop	Actual acreage	Total production	Acreage required at average yields 1/
Hay	40.0	108 tons	45.0
Corn silage	5.0	50 tons	4.6
Corn, grain	20.0	1,600 bushels	21.6
Oats	20.0	1,000 bushels	22.2
Total	85.0	---	93.4
Crop-yield index 2/			110

1/ Average yields for 127 farms as shown in table 10 are hay, 2.4 tons, corn silage, 10.8 tons, corn for grain, 74 bushels, oats, 45 bushels.

2/ Divide "acreage required at average yields" by "actual acreage" and multiply by 100.

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